REMARKS

Claims 1, 16, 18, and 31 have been amended. Claim 45 has been canceled. Claims 1-3, 6-14, 16, 18, 21-29, 31, and 36-44 are now pending. Applicants reserve the right to pursue the original claims and other claims in this and other applications. Applicants respectfully request reconsideration of the above-referenced application in light of the amendments and following remarks.

Claims 1-3, 6-16, 18, 21-31, and 34-45 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,376,309 ("Wang") in view of Hoff or Ruzyllo. The rejection is respectfully traversed.

The cited references do not teach or suggest that a "second oxide layer is formed to have a deposited thickness of at least 60% of a targeted thickness of the second oxide layer by employing a *single* process step to form said second oxide layer," as recited in amended claim 1 (emphasis added), "growing a second oxide layer . . . at a temperature of about 850°C to about 1100°C, for about 1 second to about 10 minutes, using a gas ambient containing atomic oxygen, wherein said second oxide layer is formed to have a deposited thickness of at least 60% of a targeted thickness of the second oxide layer by employing a single process step to form said second oxide layer, wherein said targeted thickness is from about 20 Å to about 80 Å thick," as recited in amended claim 16, or growing a second oxide layer "in the presence of atomic oxygen at a temperature of less than about 900°C for a period of about 1 second to 10 minutes, and wherein said second oxide layer is formed to be deposited with at least about 60% of a targeted thickness of said second oxide layer by employing a single process step to form said second oxide layer, wherein said targeted thickness is from about 20 Å to about 80 Å thick, and said second oxide layer is deposited to be from about 12 Å to 48 Å thick," as recited in amended claim 31. Support for these claim amendments are found in Applicants' specification, pg. 13, line 9 through pg. 14, line 7.

The Office Action even acknowledges that Wang fails to show forming the second oxide layer using an oxidizing ambient in atomic oxygen to form the oxide layer with a thickness of 60% of a targeted thickness and at various temperatures and times (pg. 3). The Office Action relies upon Hoff or Ruzyllo for disclosing an oxidizing ambient using atomic oxygen since the processes in Hoff and Ruzyllo allow for oxide growth at low temperatures.

The Office Action asserts that the claims fail to describe how the targeted thickness is determined. Claims 1, 16, and 31 have been amended to rectify the Examiner's concerns. The prior art discloses forming a top oxide layer of an ONO interpoly dielectric layer with a high temperature, wet oxidation process (Applicant's specification, pg. 6, lines 13-15). The prior art process typically took about 2 hours since the actual thickness that is deposited is only 1% of the targeted thickness. For example, if the targeted thickness of the top oxide layer is 80 Å, only about .8 Å would actually grow on the nitride layer.

Applicants' claimed invention, however, provides a novel method in which atomic oxygen is used to form the top oxide layer with a deposited thickness of at least 60% of a targeted thickness of the second oxide layer employing a single process step. In the prior art, the wet oxidation process yielded only a deposited thickness that was 1-3% of the targeted thickness. Consequently, the amount of time required to grow a thicker top oxide layer is significantly reduced employing Applicants' claimed methods. Another advantage of employing Applicants' claimed methods is that the process does not need to be repeated to gain a greater thickness as is required employing prior art techniques. Accordingly, the prior art does not teach or suggest the subject matter of amended claims 1, 16, and 31.

The Office Action asserts that because Hoff and Ruzyllo disclose the use of atomic oxygen, which lowers the temperature requirements in forming an oxide layer, *i.e.*, lowers the thermal budget, proper motivation has been provided and Wang would employ the teachings of Hoff or Ruzyllo. Applicants respectfully disagree. There is no motivation to combine the cited references since Wang teaches away from the proposed combination.

Wang is directed to a method of *reducing* the gate aspect ratio of a flash memory device (Abstract). To this end, Wang discloses replacing the conventional tungsten silicide in a control gate layer with nickel silicide (Abstract). However, by combining Wang with Hoff or Ruzyllo, the gate aspect ratio in Wang would *increase* rather than be reduced since a thicker top oxide layer would result.

The gate aspect ratio in Wang would increase with the use of atomic oxygen since Wang discloses *conventionally* forming the top oxide layer. Specifically, "the second of the two oxide layers of the dielectric layer 410 is formed using a nitride oxidation technique at about 950°C," (Col. 3, lines 50-51), which is a conventional method of forming the top oxide layer. *See* Applicants' specification, pg. 6, lines 15-17 ("oxidizing the nitride layer in steam and oxygen at a high temperature of about 950°C . . . [provides an] actual thickness that is deposited [which] is only about 1% of the targeted thickness").

As a result, the actual deposited thickness of Wang's top oxide layer would only be about 1% of the targeted thickness. Using atomic oxygen in Wang would increase the thickness of the top oxide layer, and accordingly, increase the gate aspect ratio. One skilled in the art would not be motivated to use atomic oxygen in Wang since the gate aspect ratio would increase rather than decrease, even if a lower temperature could be used. The proposed combination would defeat the very problem

that Wang is directed to solving.

"A statement that modifications of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art' at the time the claimed invention was made because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references." M.P.E.P. § 2143.02. There is no objective reasoning to combine Wang with Hoff or Ruzyllo where the proposed combination would increase the gate aspect ratio in Wang.

Further, the proposed combination is improper hindsight reconstruction. The Office Action asserts that with respect to the particular time and temperature of the oxidation, it would have been obvious to determine through routine experimentation the optimum time and temperature to conduct the oxidation process based upon a variety of factors including the desired thermal budget and would not lend patentability to the instant application absent the showing of unexpected results (pg. 3). Applicants respectfully submit that this is *not* the standard for a 35 U.S.C. § 103(a) rejection. "To establish *prima facie* obviousness of a claimed invention, *all* the claim limitations must be taught or suggested by the prior art." M.P.E.P. § 2143.03 (emphasis added).

In this case, none of the references, alone or in combination, teach or suggest Applicants' claimed temperatures and times that are to be used with the atomic oxidation process. Consequently, no evidence of unexpected results is required since the Office Action has failed to set forth a *prima facie* case of obviousness. *See* M.P.E.P. § 2144.05.

For example, "[i]n the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art, a *prima facie* case of obviousness exists." M.P.E.P. § 2144.05. Similarly, a *prima facie* case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Id.*

In the present situation, however, none of the references disclose or suggest forming a second oxide layer "at a temperature of about 850°C to about 1100°C, for about 1 second to about 10 minutes, using a gas ambient containing atomic oxygen," as recited in claim 16, or a second oxide layer that is "grown in the presence of atomic oxygen at a temperature of less than about 900°C for a period of about 1 second to 10 minutes," as recited in claim 31, or that the "second oxide layer is grown at a temperature of about 850°C to about 1100°C," as recited in dependent claim 2.

In fact, Hoff and Ruzyllo disclose that the use of atomic oxygen allows the oxidation process to be carried out at a temperature of 400-450°C. Consequently, even if the references are properly combinable, which they are not, Wang would employ an oxidation process using atomic oxygen at a temperature between 400-450°C and not between 850°C to about 1100°C. Since the references do not teach or suggest Applicants' claimed limitations, the Office Action has not set forth a *prima facie* case of obviousness.

As such, the cited references do not disclose or suggest a method of forming a flash memory cell by "forming an insulating layer comprising a first oxide layer . . . a nitride layer . . . a second oxide layer . . . said second oxide layer grown by oxidizing said nitride layer with a gas ambient containing atomic oxygen, wherein said second oxide layer is formed to have a deposited thickness of at least 60% of a targeted thickness of the second oxide layer by employing a single process step to form said

second oxide layer," as recited in claim 1.

The cited references do not disclose or suggest a method of forming an ONO insulating structure by "growing a second oxide layer . . . at a temperature of about 850°C to about 1100°C, for about 1 to about 10 minutes, using a gas ambient containing atomic oxygen, wherein said second oxide layer is formed to have a deposited thickness of at least 60% of a targeted thickness of the second oxide layer by employing a single process step to form said second oxide layer, wherein said targeted thickness is from about 20 Å to about 80 Å thick," as recited in claim 16.

Similarly, the cited references do not disclose or suggest a method of forming a flash memory array containing a plurality of flash memory cells, each of said plurality of flash memory cells being formed by the acts of "forming an insulating layer comprising a first oxide layer . . . a nitride layer . . . a second oxide layer . . . wherein said second oxide layer is grown in the presence of atomic oxygen at a temperature of less than about 900°C for a period of about 1 second to 10 minutes, and wherein said second oxide layer is formed to be deposited with at least about 60% of a targeted thickness of said second oxide layer by employing a single process step to form said second oxide layer, wherein said targeted thickness is from about 20 Å to about 80 Å thick, and said second oxide layer is deposited to be from about 12 Å to 48 Å thick," as recited in claim 31.

Claims 2-3 and 6-15 depend from claim 1, claims 18 and 21-30 depend from claim 16, and claims 36-45 depend from claim 31. These claims should be allowable for at least the reasons set forth above regarding independent claims 1, 16, and 31, and on their own merits. The rejection should be withdrawn and the claims allowed.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue..

Dated: June 10, 2005

Respectfully submitted,

By_____

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